



The **CRUSHED STONE JOURNAL**

In This Issue



Sixteenth Annual Convention Draws
Gratifying Attendance



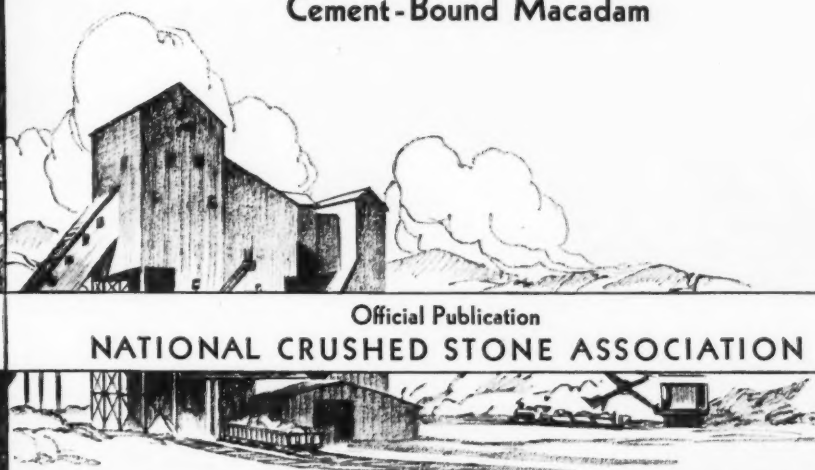
Presidential Address



Highway and Building Congress Adopts
Constructive Program



Cement-Bound Macadam



January-February • 1933

Official Publication
NATIONAL CRUSHED STONE ASSOCIATION

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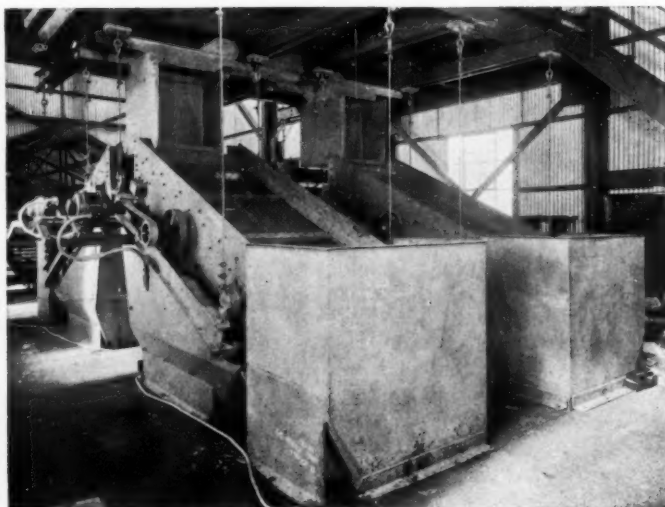


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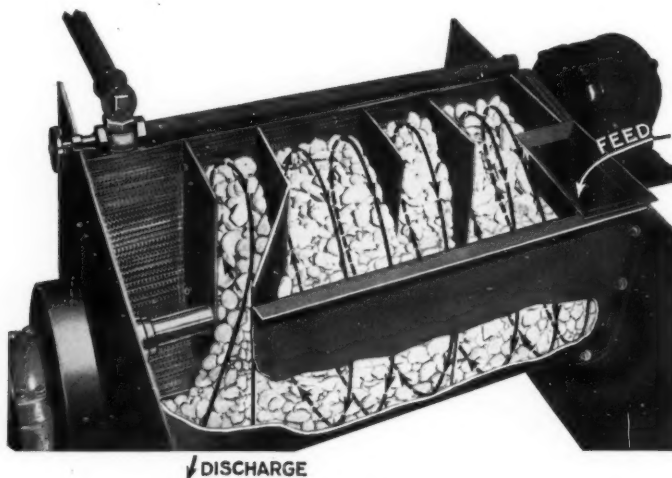
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A. L. WORTHEN
The Connecticut Quarries Co., Inc.
Re-elected President of the National Crushed
Stone Association

THE CRUSHED STONE JOURNAL

WASHINGTON, D. C.

Vol. IX No. 1

JANUARY-FEBRUARY, 1933

Sixteenth Annual Convention Draws Gratifying Attendance

FACED with problems of unusual significance and importance to the economic health of the crushed stone industry, producers from all parts of the United States and Canada foregathered in Detroit during the week of January 16, 1933, for the Sixteenth Annual Convention of the National Crushed Stone Association which was held at the Book-Cadillac Hotel on the 16th, 17th and 18th. Much concern was expressed during the period of preparation for the convention as to possible attendance, many holding the opinion that a drastic decrease was inevitable in view of the present economic situation, especially in the light of the trying conditions which practically all crushed stone producers have had to face during the last eighteen months. Such "doubting Thomases", however, had not reckoned on the loyalty and unswerving determination of the crushed stone industry to go forward in spite of the most discouraging obstacles. We have builded better than we realized, for an industry which can muster some three hundred delegates from all sections of the country under present-day conditions demonstrates in no unmistakable terms its solidarity of purpose and continuing belief in cooperative effort. Since the establishment of our Association in 1918 we have been forging the bonds which today stand between us and economic chaos. True, they have been sorely strained, but that they still hold should be personally gratifying to every member of the Association.

Other conventions of our organization have enjoyed a larger attendance, programs containing a greater variety of subjects and more elaborate entertainment arrangements. But the Detroit Convention just concluded was outstanding for the serious and thoughtful attention which was given the business side of the convention. Increased interest in the papers presented was evidenced by more general discussion participated in upon the floor of the convention. It was frankly admitted that conditions at present are bad and that

◆ A. L. Worthen Re-Elected President
for Third Successive Term. Joint Ex-
position is a Decided Success.

the outlook for the immediate future is none too promising. Yet, despite this, there was certainly the feeling that we should look to the future with courage and foresight and do our part towards bringing about an improvement in conditions. Without further introduction, we shall endeavor to give a brief account of our Detroit meeting.

After calling the convention to order on Monday morning, January 16, President A. L. Worthen, following a custom of long standing, asked the assemblage to rise in silent tribute to the memory of the following members who had passed away since the previous annual meeting.

John E. Weber, Secretary, Casper Stolle Quarry & Contracting Co., East St. Louis, Ill.

B. D. Pierce, Jr., Connecticut Quarries Co., Inc., Bridgeport, Conn.

Howard M. Rigg, Superintendent, Acme Limestone Co., Alderson, W. Va.

O. P. Chamberlain, formerly President, Dolese & Shepard Co., Chicago, Ill.

George Earnshaw, Illinois Powder Mfg. Co., St. Louis, Mo.

Following this tribute to our departed members, President Worthen made his Presidential Address, his remarks in full text being given elsewhere in this issue. Because of the trying conditions facing the Association during the coming year, his message should be of unusual interest and we urge that every member who did not have the opportunity of hearing it in Detroit give it a careful reading.

Reports from the various directors of the Association which reflected a comprehensive cross-section of business conditions throughout the industry were next heard. From these reports it was brought out that production in different areas of the country had varied from some fifteen to fifty per cent below the figures

for 1931. As was to be expected, the reports indicated that prices on the average have been substantially lowered, but the level maintained was surprisingly good in the face of severe competitive conditions which have existed throughout the past year. A most encouraging indication was an apparent acceptance of the fact



Russell Rarey, who presided at the Greeting Luncheon on Monday

that no good end is served by reducing prices below the actual cost of production merely to get business, and a recognition of this principle should do much to stabilize the price structure during 1933. Many reported that in spite of severely curtailed operating schedules, production costs have been maintained at nearly the level of former years and this would seem to indicate that when production increases, operating costs will be substantially lower. Intensive efforts to secure such business as existed

acted to prevent any substantial decrease in sales costs. As regards prospects for 1933 the directors' reports did not indicate that any decided or substantial upturn is anticipated; neither is it expected that production will show any further severe falling off. We gather from a review of these reports that the Board by no means feels the situation is hopeless, and that the lessons learned during this period of adversity will prove decidedly valuable when business is resumed again on a more nearly normal level.

George E. MacIlwain, business economist and analyst, who has talked to us most interestingly on a number of occasions in the past, gave a timely and interesting discussion of the present economic situation and his opinion as to possible improvement during 1933. In concluding his remarks Mr. MacIlwain gave a brief summary of the situation as he views it as follows:

"To sum up the situation, I believe that we have turned the corner in business. I believe that in general our course is going to be upward to better levels for some time. I believe that with a reasonable amount of sense and caution we have fairly clear sailing ahead of us, but it is not going to be an easy fight. There are still threats that hang over us, and it is to be hoped that we all by this time realize the extreme seriousness of what we have been going through and sense how important it is to buckle down to this stern job of getting back to business.

"You might as well recognize this thing I have said several times, that our progress is not going to be

rapid. If, as I hope, 1933 is a better year than 1932, I think we should see some downs in it as well as some ups. Last of all, it is going to be a long while before we get back to anything that we can call normal in business.

"Yet, in spite of all these things, we have had such a thorough housecleaning in industry after industry, and our working machinery is in such excellent condition that we are going to find ourselves pretty well satisfied in the years right ahead of us with levels of business activity which would have seemed pitifully small a few years ago.

"I think the railroads are an excellent illustration of this situation, as well as the steel industry to which I have referred. I imagine that there are a dozen of our leading railroads that, with twelve or fifteen per cent increase in tonnage freight, would find themselves able to resume dividends to their stockholders, so serious, and so widespread, and so thorough has been the readjustment of their working conditions. Most of our great industries are in position to make money and to call themselves prosperous on fifty per cent of the business that they enjoyed four years ago. I think that is the encouraging thing about the situation. We have done what we have been exhorted to do, not because we have been exhorted but because there wasn't anything else for us to do.

"I hope you realize these things, and I rather think you do. If what I have said to you has sufficed to bring them more forcibly to your attention, then I shall have been of some service to you this morning."

It will be remembered that Russell Rarey acted as Toastmaster for the banquet at the Cincinnati Convention, but because of a severe attack of laryngitis was hardly able to do justice to the occasion. Because of this unfortunate circumstance we felt the Association should be given a further opportunity to enjoy his keen wit and gracious manner which combine to make him such an excellent presiding officer. We therefore prevailed upon Mr. Rarey to preside over the Greeting Luncheon on Monday noon and he did so in a manner which contributed much to the success of this feature of the convention.

For a number of years we have been aware of the rapidly spreading fame of Billy B. Van, a famous comedian on the stage a good many years ago, and now a most successful soap manufacturer. Do you recall that distinctive little cake of green Pine Tree soap in the William Penn Hotel at Pittsburgh? Well, that's the soap that Billy B. Van makes. We then had evidence of his excellence as a soap manufacturer, but it took our Detroit Convention to give us first-hand information of his ability as a speaker. His talk to us at the Greeting Luncheon was under the title, "Sunshine in Business", which proved highly inspirational and entertaining. His keen Yankee wit and homely

New England philosophy proved a real treat to those who had the privilege of hearing him.

The Monday afternoon session, presided over by Arthur S. Lane, Treasurer, John S. Lane and Son, Inc., Meriden, Conn., and largely devoted to matters of specific technical interest, was opened by Maurice Holland, Director, Division of Engineering and Industrial Research, National Research Council, New York City, with a paper entitled "Research—Industrial Insurance." Mr. Holland, with the aid of many interesting examples, demonstrated the absolute necessity for industrial research if success is to be attained under our present economic set-up. He spoke in glowing terms of the research activities of the National Crushed Stone Association and made eloquent appeal for the continuation of these activities, pointing out a number of research problems of definite and immediate importance to crushed stone producers, including research on the stability of various bituminous mixes and on the characteristics of stone suitable for different purposes.

A recent development in the field of highway construction and one which should prove of exceptional interest to crushed stone producers is the so-called cement-bound macadam road. We counted ourselves especially fortunate in having E. M. Fleming, Manager, Highways and Municipal Bureau, Portland Cement Association, Chicago, Illinois, present this subject, which was followed by discussions by J. H. Bixby, District Engineer, New York State Highway Department, Poughkeepsie, New York, and H. A. Pearson, Fred T. Ley & Co., Springfield, Mass., who substituted for Ernest Ashton, Chemical Engineer, Medusa Portland Cement Co., Wampum, Pa. Because of the timeliness of this subject it has seemed worthwhile to publish Mr. Fleming's paper and the subsequent discussion in full in this issue of the *Journal*. Consequently we will offer no further comments at this time.

A problem of very real importance confronting highway engineers of today is the present demand for greater safety, larger capacity and higher speed, requiring highways of adequate width, non-slippery surfaces and long sight distance alignment and profile. The widening of previously constructed highways has therefore become a matter of immediate consideration. Fred Swineford, Chief Engineer, Ohio Crushed Stone Association, Columbus, Ohio, gave an interesting and informative paper on the subject, "The Use of Crushed Stone for Widening Highways", the discussion on which was led by George Martin, Consulting Engineer, General Tarvia Department, The Barrett Co., New York City. Mr. Swineford devoted a large portion of his paper to a technical discussion of methods for widening pavement with crushed stone which are being used in Ohio today. In concluding his remarks he gave the following significant comments:

"States, counties, cities, and townships, confronted with the necessity of widening their pavements, can use crushed stone with economy and satisfaction for—

1. Widening narrow pavements with water-bound or bituminous bound base extensions.
2. For resurfacing extra widths and resurfacing old pavements with stone and bituminous binders incorporated into pre-mixed, road-mixed, penetration or surface application methods.
3. For widening and superelevating curves.
4. For non-slippery bituminous treatments along the edge of old pavements.
5. For building and maintaining road shoulders for safety and convenience."

Mr. Martin, in opening the discussion of Mr. Swineford's paper, briefly outlined the way in which stone and tar may be combined in widening pavements. He also laid particular emphasis on the point made by Mr. Swineford that a layer of stone screenings on top of the subgrade is especially effective in preventing the subgrade from coming up in the spaces between the stone.

On Monday evening the Joint Exposition of the Manufacturers' Divisions of the National Crushed Stone Association, the National Ready Mixed Concrete Association and the National Sand and Gravel Association was formally opened. Conventions of these three organizations have been held in the same city before, but with individual expositions. The Joint Exposition in Detroit this year was therefore in the nature of an experiment and one which seemed to prove highly successful and most satisfactory to both exhibitors and the active members of the respective associations. Though no definite action has yet been taken regarding plans for 1934, very earnest consideration will certainly be given to the advisability of continuing this arrangement. The exposition again proved to be one of the outstanding features of the convention and exhibitors are to be most heartily congratulated upon the excellence of their displays. At the conclusion of this article there is given a list of the companies participating in the Joint Exposition.

The Tuesday morning session, presided over by Wm. E. Hilliard, Gen. Mgr., New Haven Trap Rock Co., New Haven, Conn., opened with a brief statement by A. W. McThenia, Acme Limestone Co., Alderson, W.



Arthur S. Lane, Presiding Officer at the Monday afternoon session

Va., in which he gave some important comments with regard to the "Use of Stone Sand in the Big Bend Tunnel on the Chesapeake and Ohio Railroad", Mr. McThenia's company having supplied the stone sand for this project. C. B. Porter, Resident Engineer of the Chesapeake and Ohio Railroad Co., Clifton Forge, Va.,



William E. Hilliard, Presiding
Officer at the Tuesday
morning session

had been scheduled for this presentation, but due to illness and death in his family was prevented from attending. The discussion following Mr. McThenia's comments was led by F. O. Biehn, C. C. Beam, Inc., Melvin, Ohio. Mr. Biehn pointed out that in his opinion stone sand is the greatest development that has been made in the crushed stone industry for many years, because it turned what was formerly considered an unavoidable waste into a remarkable product. His

remarks were especially informative and we hope to be able to publish them in a subsequent issue of the *Journal*.

A problem which is proving most perplexing to producers today is that of revaluing plants in the light of present-day conditions. Some very helpful information was given on this subject by George D. Bailey, Detroit Partner, Ernst and Ernst, Detroit, Michigan, in his discussion entitled "The Readjustment Era—Its Relation to Plant Values." In a most interesting and helpful discussion of Mr. Bailey's paper Mr. Wm. E. Hilliard pointed out that the writing down of plant values is by no means merely a bookkeeping procedure and should not be done hastily or without considering its effects on future operations. Some of the factors which Mr. Hilliard pointed out that must be considered in revaluing plants are as follows:

1. The excessive plant capacity beyond what is necessary to meet the normal demands or trends in the individual business and the industry.

2. The excess capacity in the industry as a whole, and the relative position of the company within the industry.

3. The trends in style of product that will affect the useful life of the present assets.

4. The cost of replacement, based on lower price levels for material and labor represented in the assets.

5. The development and improvement in design for machinery and equipment used in production.

Although business has been very slack in most lines

in the last few years, a great deal of progress has been made in the direction of improving design of machinery and equipment. This tends to hasten obsolescence and shorten the useful life and value of present assets. This improved equipment will find its way into the hands of companies who are able to buy it.

6. Excessive state and local taxes resulting from the use of fictitious book values.

7. Earning power of assets, such, for instance, as the future rental income of dwellings owned by a corporation and rented to its employees. The rental, of course, now and in the immediate future will be substantially less than such a company has been obtaining in the recent past.

8. Changes in production, quality and manufacturing processes."

We always look forward with interest and pleasure to hearing from F. H. Jackson, Senior Testing Engineer of the U. S. Bureau of Public Roads, and this was especially true this year for we have not had the privilege of having him talk to us since his appearance before our convention in 1927, when he discussed "Commercial Sizes of Broken Stone." This year he spoke to us on "Standardization of Sizes" and it is therefore evident that the question of sizes has been one of vital concern to crushed stone producers for many years. Unfortunately not so much progress has been made in the direction of the standardization of sizes as was expected. Mr. Jackson attributed this slow progress to the lack of a mandatory specification, as a guide from which local specifications might be drawn. He told us, however, that the Federal Specifications Board has now approved a mandatory specification for Federal work and that more rapid results may be expected as a result of this move. This specification recommends two basic groups of five sizes for hard and soft aggregates and suggests that the smallest possible number of intermediate sizes be used. Though progress has been slow, Mr. Jackson feels that definite gains are being made which will be decidedly helpful to crushed stone producers. The discussion which followed Mr. Jackson's paper was led by R. R. Litehiser, Chief Engineer, Bureau of Tests, Ohio Department of Highways, Columbus, Ohio, who ably presented the viewpoint of a state highway department on the question of standardization of sizes and stated that Ohio desires to cooperate in every way possible. He felt that in turn, however, when a series of standard sizes has finally been adopted and approved stone producers should reciprocate by providing stone strictly in accordance with the specifications.

Concluding the Tuesday morning session was Mr. Goldbeck's talk entitled "How the Bureau of Engineering Helps the Crushed Stone Industry", with discussion led by J. A. Rigg, Secretary-Treasurer, Acme Limestone Co., Alderson, W. Va. The enthusiastic re-

ception accorded Mr. Goldbeck's paper and Mr. Rigg's discussion marked them as a highlight of the convention program. These papers have been printed in pamphlet form under the same cover and are immediately going forward to each member company of the Association. Additional copies are available upon request to the Secretary's office.

The session on Tuesday afternoon, presided over by Otho M. Graves, President, General Crushed Stone Co., Easton, Pa., and past-President of the National Crushed Stone Association, among other subjects included the topic, "Competition from Wayside Plants", and it developed that this same subject was also scheduled on the program of the National Sand and Gravel Association for Tuesday afternoon. As that Association was holding its convention in the Book-Cadillac Hotel, it was deemed advisable to make some re-arrangement in the programs of the two associations for the afternoon, in order to permit a joint discussion of this subject. The two programs were opened separately and combined for joint discussion later in the afternoon.

Because of severe competitive conditions existing in many localities throughout the past year, interest in possible revision of the anti-trust laws has markedly increased and we therefore considered ourselves most fortunate in being able to get Gilbert H. Montague, who has talked to us so informatively on this subject in the past, to again address us at the Detroit meeting this year. Mr. Montague's topic was "Stabilization and the Anti-Trust Laws" and proved of exceptional interest. In opening the discussion of Mr. Montague's paper, Harold Williams, member of the Boston Bar and an honorary member of the Board of Directors of the National Crushed Stone Association, strongly emphasized the necessity of cooperative action by business interests to get the anti-trust laws changed and amended so as to permit reasonable agreements to be made to hold competition within limits so that it does not destroy industrial life. Mr. Williams pertinently pointed out that we do not wish the government to regulate our own business, that we wish to run it ourselves and that the way for such action can only be opened up through some revision in the anti-trust laws.

The discussion which followed clearly indicated how important this subject has become in the minds of crushed stone producers and a crystallization of thought through Mr. Montague's paper and the subsequent discussion resulted in the Association's going on record in favor of revision of the anti-trust laws, as noted in a resolution adopted by the convention and given elsewhere in this issue.

Following the discussion of Mr. Montague's paper our meeting was combined with that of the National Sand and Gravel Association for a joint consideration of the problem of wayside competition.

Through courtesy of the National Sand and Gravel Association, Mr. Graves continued as chairman of the joint session. As the first speaker, J. M. Fitzgerald, Vice-Chairman, Committee on Public Relations of the Eastern Railroads, New York City, presented a paper entitled, "Transportation by Rail and by Truck", in which he gave an interesting discussion of the railroads' point of view in this difficult and complex transportation problem.

In opening the symposium on competition from wayside plants, A. T. Goldbeck, Director of the Bureau of Engineering of the National Crushed Stone Association, and Stanton Walker, Director, Engineering and Research Division, National Sand and Gravel Association, gave a comprehensive picture of recent developments in this field. Following them, John Prince, John Rice, Jr., C. Gray, J. Rutledge Hill, A. E. Frosh and C. L. Moyer, representing H. M. Chapman, Assistant Director and Chief Engineer, Ohio Department of Highways, Columbus, Ohio, spoke in the order named. The various speakers portrayed conditions existing in their respective localities, substantiating the facts developed in the two principal papers given by Mr. Goldbeck and Mr. Walker. It was brought out that in some instances states, ultimately dependent upon the established commercial producer for highway materials, are encouraging the use of local material and that inspection in connection with the products from wayside plants was relaxed while rigidly maintained on the products of established plants. Attention was further directed to the practice of using the threat of wayside plants to force the prices of aggregates down below the cost of production.

Especial interest was manifested in what is known as the "Missouri Plan" which was described in some detail by John Prince, President, Stewart Sand and Material Co., Kansas City, Missouri. Briefly, the plan covers cooperative action by the State Highway Commission of Missouri, the commercial producers and the railroads of Missouri for the year 1933. Under this contract "the state agrees to buy all of its aggregates from producers signing the contract; in some 65% of the area of the state and covering about 65% of the material the state agrees to ship all of this material by rail from established commercial plants." This agreement was reached, Mr. Prince said, after an offer was accepted "which had been



Otho M. Graves, Toastmaster,
Highway and Building
Congress Banquet

made by the railroads, of a rate reduction in 65% of the area of 20% and of a guarantee of rate reductions in the rest of the area." Many other interesting points were brought to light during this discussion and it is hoped that it may be printed in full in the near future.

The concluding session of the convention was held on Wednesday morning



Scott Turner, Director, United States Bureau of Mines, who presented the safety awards

and was presided over by President A. L. Worthen. It was originally planned to have a discussion on gas tax diversion at our Tuesday afternoon session, but when it was decided to combine our session with that of the National Sand and Gravel Association, it developed that time would not permit of this discussion on Tuesday and consequently it was held on Wednesday morning. Thomas E. Wright, Executive Secretary, New York State Construction

Council, Rochester, N. Y., had especially arranged to come to Detroit to discuss before our convention the subject, "Organizing to Combat Gas Tax Diversion." When decision was made to have this subject carried over until Wednesday morning, it was done on the basis that Mr. Wright could remain over. It later proved, however, that an urgent engagement elsewhere compelled him to leave Tuesday night and it was with very real disappointment that we were thus deprived of the privilege of hearing him tell us of the excellent work so far accomplished by the New York State Construction Council. Fortunately, he had an opportunity of going over the material in some detail with A. G. Seitz, Vice-President - Operations, General Crushed Stone Co., Syracuse, N. Y., who opened the discussion of this topic on Wednesday morning. Claude L. Clark, Assistant Secretary, Ohio Crushed Stone Association, outlined the procedure now being followed in Ohio. Mr. Clark was followed by Ray J. Reigeluth, Treasurer, The Connecticut Quarries Co., Inc., New Haven, Conn., who gave some very interesting comments as to how the matter is being handled in Connecticut. Gas tax diversion has become one of the most serious problems of the highway industry and it is most encouraging to realize the truly effective work which is being done in a number of localities to overcome this menace to highway funds.

Suits resulting from alleged damage because of blasting seem to be an ever-present problem with crushed stone producers. It was therefore highly appropriate that we receive from Dr. F. W. Lee, Super-

vising Engineer, Geophysical Section, U. S. Bureau of Mines, Washington, D. C., a "Progress Report on the Development of Apparatus for Measuring Intensity of Ground Vibrations Resulting from Quarry Blasting." Dr. Lee was given a very difficult task in treating a subject so highly technical in a manner understandable to the layman. His talk proved of unusual interest and the apparatus which is being developed should prove highly beneficial in protecting crushed stone producers from unwarranted suits. As a supplement to Dr. Lee's discussion, the Bureau of Mines had on display in the Joint Exposition the equipment which he described in his talk. The discussion following his paper and the interest displayed in the exhibit are indicative of the appreciation of the crushed stone industry for this very valuable work which the Bureau of Mines is conducting.

For many years it has been our custom to present at the annual convention safety awards to those companies making outstanding accident prevention records in the National Crushed Stone Association Safety Contest. It will be recalled that this contest is conducted under the auspices of the U. S. Bureau of Mines in co-operation with the Association. Last year in Pittsburgh we counted ourselves most fortunate in having Mr. Scott Turner, Director of the U. S. Bureau of Mines, present the safety awards. We invited him to again present these trophies this year in Detroit, but realized that possibly because of the greater distance and the many demands made upon his time he would not be able to make the trip. We were therefore very deeply gratified to learn that Mr. Turner would personally present the trophy for us in Detroit and the industry is certainly deeply indebted to him for his gracious courtesy in this regard. In presenting the trophy, "Sentinels of Safety", to the winner of the 1931 contest, Mr. Turner spoke in part as follows:

"Today I am here to help in the presentation of the 1931 trophy of your Association. I am glad to participate, as I did last year, in an event that arouses my personal and official interest. The contest for 1932 has just closed, but the winner will not be known until later, when all records have been checked and graded.

"Sixty-one plants, all operated by members of the National Crushed Stone Association, were enrolled in the 1931 competition. The exposure to risk at these properties totaled more than five million man-hours. All but three plants were open quarries; these three were underground limestone mines. No less than sixteen of the sixty-one operations were continued for a year without one lost-time accident; it was therefore necessary to select the winner on the basis of volume of exposure to hazard.

"When all sixty-one plants had been uniformly graded, we were able to identify the best safety record. It was that of the Martinsburg, West Virginia, plant

of the North American Cement Corporation, known as the Nos. 5 and 6 limestone quarry; its record of operating in 1931 showed 115,403 man-hours of work without one lost-time accident.

"This does not tell the whole story of the distinguished safety achievement of this quarry. Let me remind you that it also won first place in the National Safety Competition of 1926 conducted by the Bureau of Mines, and in two other years has won honorable mention.

"It is therefore with great satisfaction that I announce the North American Cement Corporation as the winner of the 1931 safety contest, and award the trophy to that company on the safety record of Nos. 5 and 6 limestone quarry, Martinsburg, W. Va.

"The National Crushed Stone Association also accords recognition to each company whose plant had no lost-time accident during the year. You will be pleased to know that the following fifteen plants have well earned honorable mention for their records in 1931—they are:

- "The General Crushed Stone Company's trap-rock quarry at Quakertown, Bucks County, Pa.
- Union Limestone Company's limestone quarry at Hillsville, Lawrence County, Pa.
- Columbia No. 3 limestone mine, Valmeyer, Monroe County, Ill., operated by the Columbia Quarry Co.
- Birdsboro crushed stone quarry, Birdsboro, Berks County, Pa., operated by The John T. Dyer Quarry Co.
- Akron limestone quarry, Akron, Erie County, N. Y., operated by the General Crushed Stone Co.
- Rock-Cut limestone quarry, Syracuse, Onondaga County, N. Y., operated by the General Crushed Stone Co.
- Security limestone quarry, Security, Washington County, Md., operated by the North American Cement Corp.
- Middlefield traprock quarry, Wallingford, New Haven County, Conn., operated by The Connecticut Quarries Co., Inc.
- Knippa No. 4 traprock quarry, Knippa, Uvaldo County, Texas, operated by the Southwest Stone Co.
- Gasport dolomite quarry, Gasport, Niagara County, N. Y., operated by the Wickwire Spencer Steel Co.
- Speed Mill cement quarry, Speed, Clark County, Ind., operated by the Louisville Cement Corp.
- Hendlers quartzite quarry, Wilkes-Barre, Luzerne County, Pa., operated by the General Crushed Stone Co.
- Duluth traprock quarry, Duluth, St. Louis County, Minn., operated by the Duluth Crushed Stone Co.
- Rocky Hill traprock quarry, Rocky Hill, Hartford County, Conn., operated by The Connecticut Quarries Co., Inc.
- Mt. Carmel traprock quarry, Mt. Carmel, New Haven County, Conn., operated by The Connecticut Quarries Co., Inc."

Parchment reproductions of the "Sentinels of Safety" award are given to each company receiving honorable mention. In response to Mr. Turner's request that representatives of the companies receiving honorable mention come forward, the following representatives received the certificates in person:

- A. G. Seitz, Vice-President-Operations, General Crushed Stone Co.
- W. W. Duff, General Superintendent, Union Limestone Co.
- E. J. Krause, President, Columbia Quarry Co.

- H. M. Craig, John T. Dyer Quarry Co.
- E. T. Nettleton, The Connecticut Quarries Co., Inc.
- W. F. Wise, President, Southwest Stone Co.
- W. E. Foote, Superintendent, Wickwire Spencer Steel Co.

In accepting the trophy on behalf of the North American Cement Corporation, A. R. Couchman said, "It is with a great deal of pleasure that I accept this trophy in behalf of the North American Cement Corporation and the employees of its Berkeley plant. We are appreciative, indeed, of this honor that has been conferred upon us. There is real satisfaction to know that with other plants and quarries we are succeeding in making the production of crushed stone increasingly safe each year and accident waste, which affects materially our economic aspects in these stressing times, is being reduced to a minimum." Mr. Couchman emphasized the stimulating and inspiring influence of such safety contests and expressed the hope that they might be continued in the future.

The remainder of the Wednesday morning session was devoted to the business affairs of the Association, including presentation of reports from the Auditing Committee and Resolutions Committee, discussion by the President of the fiscal affairs of the Association, and election of officers.

The Resolutions Committee this year was faced with an exceptionally arduous task, for in addition to resolutions originating within our Association, a number of highly important resolutions were submitted for approval by the Resolutions Committee of the Highway and Building Congress. Under the able leadership of John Rice as Chairman, greatly assisted by Harold Williams, this committee discharged its responsibilities in a highly commendable manner. To the personal knowledge of the writer this committee met one evening from about eight o'clock until after midnight and the sincere appreciation of the Association is due them for the painstaking and thoughtful consideration with which they undertook their work.

In making the report of the Nominating Committee for E. J. Krause, its chairman, Mr. Graves explained the difficulty confronting the committee in determining upon a selection for President because of the feeling that it was unfair to Mr. Worthen and to the Connecticut Quarries Co., Inc., to ask that he serve the Association for another year. He stated that the committee had interviewed several men who in their judgment would suitably conduct the affairs of the Association during the ensuing year. Each of these men felt unable to assume the task for the very reason which prompted the committee not to ask Mr. Worthen, realizing that in such times of stress, each one of us needs all of his time for his own business affairs. After consultation with other officers of Mr. Worthen's company, consent was obtained for him to act as President of the Association for another year, in view of

In Appreciation

RESOLVED, That the National Crushed Stone Association, in convention assembled in Detroit during the week of January 16, 1933, at the Book-Cadillac Hotel, wishes to express personal thanks and appreciation to the Book-Cadillac Hotel and to each and every one of its employees for their cordial welcome and solicitous care for our welfare and pleasure during our stay in Detroit.

The National Crushed Stone Association, in convention assembled in Detroit during the week of January 16, 1933, welcomes the occasion to express to our fellow members of the Manufacturers' Division our high appreciation of the Joint Exposition by the Manufacturers' Divisions of the National Crushed Stone Association, the National Ready-Mixed Concrete Association, and the National Sand and Gravel Association, because of its unique and interesting character and its manifestation of their strong sense of cooperation with the associations of which they form so vital a part.

The National Crushed Stone Association, in convention assembled in Detroit during the week of January 16, 1933, at the present time takes the occasion to thank Mr. Scott Turner, Director of the United States Bureau of Mines, for emphasizing the value and importance of the accident prevention work by coming to Detroit in person to present the award of the National Crushed Stone Association Safety Contest to the North American Cement Corporation of Martinsburg, West Virginia, and also to congratulate this company individually and collectively upon its record.

WHEREAS, The National Crushed Stone Association is appreciatively cognizant of the value to the crushed stone industry of the services rendered by the United States Bureau of Mines through the publication of technologic, statistical and economic information, important to the industry; through safety and first aid training of workers whereby the human life and money cost of industrial accidents have been materially reduced; through engineering investigations and technical research; through a detailed study of

uniform cost accounting methods, and by the sympathetic and understanding advice and counsel of its staff, and

WHEREAS, The Association has observed the efficient manner in which the work of the bureau is now being administered and the activities coordinated to provide maximum service at minimum costs, and desires the uninterrupted continuation of these essential aids to its members and the mining industry in general, and

WHEREAS, It is the belief of the Association that the value of experience and training in the direction of technical and scientific bureaus engaged in highly specialized work transcends all other considerations, now, therefore, be it

RESOLVED, That the National Crushed Stone Association, representing an industry, the value of whose normal annual production is in excess of one hundred million dollars, in annual convention assembled in Detroit, the week of January 16th, 1933, hereby expresses its appreciation and approval of the efficient manner in which the work of the Bureau of Mines is now being administered, and be it further

RESOLVED, That the National Crushed Stone Association earnestly urges that mining, quarrying and metallurgical industries be not required to bear the burden of a decrease in the service now rendered by the Bureau of Mines, which would result from a decrease in its appropriations, but that to the contrary its appropriations be increased to the fullest possible extent so that these industries may enjoy the benefits which the Bureau of Mines is able and willing to bestow, if not unduly hampered by financial restrictions, and be it further

RESOLVED, That the Secretary of the National Crushed Stone Association be, and hereby is instructed to forward a copy of these resolutions to the Director of the United States Bureau of Mines.

RESOLVED, That the National Crushed Stone Association in convention assembled in Detroit, during the week of January 16, 1933, extends its hearty good will to the National Sand and Gravel Association and voices its sincere approval of the spirit of harmony and mutual courtesy which has so clearly prevailed.

Revision of the Anti-Trust Laws

WHEREAS, The Association loyally supports the fundamental American principle of free competition in industry and the right of the consuming public to buy in competitive markets, but maintains that there can be no right to purchase any material at prices below the fair economic cost at which its production can be permanently continued, and

WHEREAS, The Association believes that the natural law of self-preservation includes an inherent right of those engaged in industry to cooperate for the purpose of curbing competition between them when, under conditions such as exist today, unlimited and destructive competition threatens the entire structure of American business, and

WHEREAS, The Association is positively convinced that the existing Anti-Trust laws, restricting, as they do, the business cooperation which alone can restore and preserve our national industries, should be so amended as to conform to the needs of the era in which we live, now, therefore, be it

RESOLVED, That the National Crushed Stone Association, in its Annual Convention assembled, hereby formally puts itself on record as advocating an immediate amendment of the Federal Anti-Trust Laws so as to permit agreements or arrangements to prevent uneconomic competition and to effect proportionate reduction or regional distribution of production to conform to the need of market demand, where such agreement or arrangements do not increase prices beyond the fair limits of sound economic principle and a due regard for the welfare of the public.

In Memoriam

WHEREAS, Colonel O. P. Chamberlain died in Chicago on December 10, 1932, and

WHEREAS, Colonel Chamberlain was actively engaged in the crushed stone industry for a major portion of his life, during which time the influence of his personality, character and business ability was beneficently exerted in territories far beyond the one in which his business was actually conducted, and

WHEREAS, He had loyally, faithfully and effectively supported the National Crushed Stone Association since the time of its inception, having served continuously on its Board of Directors, and

WHEREAS, The National Crushed Stone Association is decidedly aware of the loss to the Association of a faithful member and inspiring leader, and of the loss to the industry of one who was outstanding in its activities, and of the loss to each one of those who had the good fortune to know him of a sincere and affectionate friend of lovable disposition and characteristics, and above all, being cognizant of the irreparable loss to his family; now be it

RESOLVED, By the National Crushed Stone Association, in convention assembled at the Book-Cadillac Hotel, Detroit, the week of January 16, 1933, that the deepest sympathy of the Association, as well as of each of its members, individually, be extended to his bereaved family, and that a copy of these resolutions be spread upon the minutes and published in *The Crushed Stone Journal*, and further, that a copy be sent his family as an indication that we share, with them, the grief which has come to us all.

arrangements which would be made to relieve him of some of the responsibility. Mr. Graves, in nominating Mr. Worthen for re-election for President, concluded his remarks as follows:

"If I had the time, I should like to enlarge upon the qualifications Mr. Worthen so admirably possesses to continue in office for another year. Such detailed relation, however, of his qualifications is entirely unnecessary, as you know him, you know his work, and you know what we are proposing to do for the coming year. It is with a feeling of the greatest relief and happiness and gratitude to the Connecticut Quarries Co., Inc., and to Mr. Reigeluth, that the Nominating Committee presents to this Association, in nomination for President for the year 1933, Mr. Albert Worthen of New Haven, Connecticut."

Under the temporary chairmanship of Mr. Arthur S. Lane, the report of the Nominating Committee was unanimously adopted and Mr. Worthen declared re-elected as President for the year 1933. In appreciation of the services rendered by Mr. Worthen during the last two years and of his willingness to assume this responsibility for the coming year, the entire audience arose and applauded for several minutes. The report of the Nominating Committee covering nominations for vice-presidents and the members of the Board of Directors was unanimously accepted, resulting in the election of the following:

REGIONAL VICE-PRESIDENTS

C. M. Doolittle	W. R. Sanborn
E. Eikel	T. I. Weston
A. S. Lane	A. J. Wilson
Russell Rarey	Porter W. Yett

BOARD OF DIRECTORS

A. L. Worthen, Chairman, New Haven, Conn.
 Max A. Altgelt, New Braunfels, Texas
 W. M. Andrews, Youngstown, Ohio
 C. C. Beam, Melvin, Ohio
 H. E. Billman, St. Louis, Mo.
 A. J. Blair, Milwaukee, Wis.
 L. J. Boxley, Roanoke, Va.
 C. D. Brewer, Duluth, Minn.
 J. E. Cushing, Schenectady, N. Y.
 C. M. Doolittle, Hamilton, Ont., Canada
 F. O. Earnshaw, Youngstown, Ohio
 E. Eikel, New Braunfels, Texas
 Otho M. Graves, Easton, Pa.
 F. T. Gucker, Norristown, Pa.
 George Hammerschmidt, Elmhurst, Ill.
 J. L. Heimlich, Le Roy, New York
 W. E. Hilliard, New Haven, Conn.
 E. J. Krause, St. Louis, Mo.
 A. S. Lane, Meriden, Conn.
 Thomas McCroskey, Knoxville, Tenn.
 B. A. McKinney, West Roxbury, Mass.
 F. R. Patterson, Findlay, Ohio
 John Prince, Kansas City, Mo.
 Russell Rarey, Columbus, Ohio
 John Rice, Easton, Pa.
 J. A. Rigg, Alderson, W. Va.

H. E. Rhodes, Nashville, Tenn.
 W. R. Sanborn, Kankakee, Ill.
 James Savage, Buffalo, N. Y.
 F. W. Schmidt, Jr., Morristown, N. J.
 J. F. Schroeder, Davenport, Iowa
 W. L. Spurborg, Syracuse, N. Y.
 John W. Stull, Rocky Point, Va.
 Mortimer Wandell, New York City
 T. I. Weston, Columbia, S. C.
 A. J. Wilson, Watsonville, Calif.
 W. F. Wise, Dallas, Texas
 Porter W. Yett, Portland, Ore.
 Abe Goldberg, Milwaukee, Wis.
 B. G. Shotton, Pittsburgh, Pa.
 L. W. Shugg, Schenectady, N. Y.

Following the election of officers, the Sixteenth Annual Convention of the Association was formally declared adjourned.

Exhibitors at Joint Exposition

EXHIBITORS at Joint Exposition of Manufacturers' Divisions of the National Crushed Stone Association, the National Ready-Mixed Concrete Association, the National Sand and Gravel Association were as follows:

The Allen-Sherman-Hoff Co., Philadelphia, Pa.
 Allis-Chalmers Mfg. Co., Milwaukee, Wis.
 American Manganese Steel Co., Chicago Heights, Ill.
 Blaw-Knox Co., Pittsburgh, Pa.
 C. G. Buchanan Co., New York City
 Bucyrus-Erie Co., South Milwaukee, Wis.
 Burton Explosives, Inc., Cleveland, Ohio
 Cross Engineering Co., Carbondale, Pa.
 Crucible Steel Co. of America, New York City
 E. I. duPont de Nemours & Co., Inc., Wilmington, Del.
 Eagle Iron Works, Des Moines, Iowa
 Frog, Switch & Mfg. Co., Carlisle, Pa.
 General Electric Co., Schenectady, N. Y.
 Hardinge Co., York, Pa.
 Hendrick Mfg. Co., Carbondale, Pa.
 Hercules Powder Co., Wilmington, Del.
 Jaeger Machine Co., Columbus, Ohio
 Kennedy-Van Saun Mfg. & Engr. Corp., New York City
 A. Leschen & Sons Rope Co., St. Louis, Mo.
 Link-Belt Co., Chicago, Ill.
 Ludlow-Saylor Wire Co., St. Louis, Mo.
 Manganese Steel Forge Co., Philadelphia, Pa.
 Marion Steam Shovel Co., Marion, Ohio
 Morris Machine Works, Baldwinsville, N. Y.
 Niagara Concrete Mixer Co., Buffalo, N. Y.
 Nordberg Mfg. Co., Milwaukee, Wis.
 Ohio Power Shovel Co., Lima, Ohio
 Pit and Quarry, Chicago, Ill.
 Robins Conveying Belt Co., New York City
 Rock Products, Chicago, Ill.
 Sauerman Bros., Inc., Chicago, Ill.
 Simplicity Engineering Co., Durand, Mich.
 Taylor-Wharton Iron & Steel Co., High Bridge, N. J.
 Thew Shovel Co., Lorain, Ohio
 Traylor Engr. & Mfg. Co., Allentown, Pa.
 Troco Lubricating Co., Philadelphia, Pa.
 W. S. Tyler Co., Cleveland, Ohio
 Universal Crusher Co., Cedar Rapids, Iowa
 U. S. Bureau of Mines, Washington, D. C.

Presidential Address

By A. L. WORTHEN

◆ Presented at the Sixteenth Annual Convention of the National Crushed Stone Association, Book - Cadillac Hotel, Detroit, Mich. Jan. 16-18, 1933.

It becomes my duty and privilege at this time to present to you a résumé of the activities of your Association since the last annual meeting. Two years as President has afforded me an opportunity to see more clearly than the average member the value of the Association to the industry and the individual producer.

A national association affords an opportunity for the leaders in the industry to meet once a year for a discussion of mutual problems and it is apparent now more than ever that the crushed stone industry needs this help. Our Association is the source from which you must obtain information for your individual promotional work and is the only means which the industry has for doing the even more important promotional work which must be done collectively in order to be effective.

Edward A. Filene, the Boston merchant, recently made the following statement: "The maxim that 'United We Stand, Divided We Fall' was never truer than applied to us business men in these times. My advice to myself and my business friends all over the world is: Do it now. Let us support our business organization better and more energetically, no matter how short of money we are, because if we are to get more money and more profits it will come through the united efforts of us business men. Let us, therefore, give more personal attention to the work of our organization."

It is extremely important that, as an industry, we should realize the necessity for a more solid organization than ever before. In spite of the keen and sometimes bitter competition which is always rife in times like these, research work should be pursued with renewed vigor. We must, as an organized body, promote increased construction and the use of crushed stone in this construction. Crushed stone as an aggregate is on the defensive. Other aggregates are continually being advocated as its equal in certain types of construction. This encroachment is becoming more serious and must be opposed thoughtfully and vigorously. Rapid changes are taking place in the aggregate industry. We must foresee, if possible, these changes and be prepared to meet them.

We have at Washington a well equipped plant whose personnel is fully alive to the situation. This plant is directed by Mr. Goldbeck whose national reputation as an engineer of broad experience, and whose intimate technical knowledge of the properties and application of crushed stone is of inestimable value. Failure to maintain these facilities and to use them to the ut-

most of their potentialities would indicate a lack of comprehension of the problems which lie ahead.

You will find a report of the chairmen of the various standing committees in the printed "Reports of Officers and Committee Chairmen". I shall refer only to the Research Advisory Committee. This committee, under the chairmanship of Mr. Paul Reinhold, has been very helpful to the Director of the Bureau of Engineering in determining research policies. Mr. Reinhold, despite his many duties, has been willing and eager to increase the work of this Committee and I consider it most unfortunate that the enthusiasm and interest of such an important committee should be dampened through lack of funds to carry out its recommendations. It is to be regretted that a reduced income necessitated a drastic curtailment in the research work of our Association.

The results of our Laboratory investigations have been reported and described from time to time during the year through the pages of *The Crushed Stone Journal* and in the *Useful Information* service. (It is to be deplored that insufficient funds have prevented us from carrying on other laboratory investigations which are of paramount importance.) The *Useful Information* service, judged by an ever increasing demand, is filling a real need. It is rapidly becoming a handbook of permanent value for the crushed stone industry. During the year the Bureau of Engineering has published through the *Useful Information* service eight articles on Physical Properties of Stone, ten on Concrete, two on Ballast, five on Macadam Type Roads, one on Stone Dust, two on New Uses for Crushed Stone and one on Miscellaneous Information.

At the mid-summer meeting of the Board of Directors I was instructed to inform the members concerning the Association and its activities. It was the general feeling of the Board that a large portion of our members were not cognizant of the vast amount of information and the many facilities available at Washington headquarters. A series of one-page letters were prepared and the first one mailed on October 26th. It is impossible to determine how efficacious this publicity campaign has been in sustaining or creating interest and support for the Association, but I have received some very encouraging replies from the membership.

During the year we lost twenty active members

through resignations and accepted four new members, a net loss of sixteen. Nineteen associate members resigned and five new applications were approved for a net loss of fourteen. Personally, I believe we should be encouraged by such a report in view of present conditions.

Our local associations are extremely active and in spite of a highly competitive situation there is a co-operative and friendly attitude among the members. The need for a united action to protect the crushed stone business in practically every state in the Union is so great that personal animosities due to price cutting are insignificant.

Legislatures are meeting in forty-two states this winter and, without exception, they are faced with the problem of finding some source of revenue from which to obtain funds to balance the state budget. For a number of years legislators have been dipping into highway funds as a source of easy money. However, it was not until other income was reduced to the point that the states were faced with huge deficits that the legislators commenced "macing the motorist". This legislative procedure of appropriating gasoline taxes and motor vehicle taxes for purposes other than those concerned with and related to the business of highway construction and upkeep is a serious menace to the crushed stone industry and requires prompt and vigorous opposition.

The New York State Association is energetically supporting the work of the New York State Construction Council in fighting diversion of highway funds. The Pennsylvania Stone Producers Association has recently engaged a full-time executive secretary and this Association is working in close harmony with the Pennsylvania Construction Council. The New England Association is meeting regularly and is carefully following all legislation in its territory. Other local associations and hastily organized state groups are making a concerted effort to protect highway funds. Closer contact between the National Association and these local groups would keep a larger percentage of our members accurately informed on the work of our Bureau of Engineering and would afford Mr. Goldbeck a better understanding of local problems. I strongly recommend that the incoming Board of Directors provide, if possible, a sufficient appropriation for travel expense to enable Mr. Goldbeck and Mr. Boyd to attend the meetings of local associations more frequently.

When President Wise referred in his address two years ago at St. Louis to "the depression under which this country as well as the world has been struggling throughout the entire year", I doubt whether he or any of those present at that time could have, by the wildest imagination, foreseen, even vaguely, the conditions which have prevailed throughout the entire crushed stone industry during the past year. Those

of you who can look back over previous depressions will recall that public works construction, particularly road building, was resorted to in order to relieve unemployment.

Money used for highway construction provides practical employment for many hundreds of thousands and, when diverted for other purposes, the result is to throw more men into the breadline. If this convention does nothing more than awaken you to the necessity of protecting highway funds in your state and furnish you with methods and arguments which have already proved helpful, your officers will feel repaid.

Another serious problem is the question of Association finances. We must try to solve this problem while assembled here this week. The proper time for discussing this question is at the general business meeting on Wednesday morning and I shall therefore postpone my remarks until that time.

Accident prevention is receiving greater attention each year by members of our Association. Of 173 companies participating in the United States Bureau of Mines Safety Contest, a substantial number of which were cement plants, 61 were members of our Association. Fifteen of the 61 completed the year 1931 without a lost-time accident, establishing perfect records. These 61 plants worked a total of 5,100,000 man hours and reported 4 fatal accidents, 0 permanent disabilities, 13 permanent partial disabilities, 198 temporary disabilities—a total of 215 accidents, resulting in 46,200 days lost.

At the annual meeting of the Quarry Section of the National Safety Council in October, Otho M. Graves was elected General Chairman. Mr. Graves has taken hold with the same inexhaustible energy and enthusiasm which is characteristic of all that he does and we can be assured of a larger and more active section.

It was a keen disappointment to your officers when the Manufacturers' Division decided to forego their annual Fall meeting and dinner. Many active members had come to anticipate this annual gathering with a great deal of pleasure. It is my personal opinion that this meeting was a distinct asset to the Association and it is therefore my earnest hope that the officers of the Manufacturers' Division will find a way to resume this annual gathering which had become such a pleasant event in the year's activities. I wish to take this opportunity of expressing, on behalf of the National Crushed Stone Association officers and myself, our hearty appreciation for the effective cooperation received throughout the entire year from the Manufacturers' Division, especially its officers. Our Manufacturers' Division has combined with the Manufacturers' Division of the Sand and Gravel Association in putting on a joint exposition at this hotel. They have prepared for you an attractive and instructive show

(Continued on page 23)

Highway and Building Congress Adopts Constructive Program

FOLLOWING the conclusion of the individual conventions of the many organizations holding annual meetings in Detroit during the week of January 16, the first Highway and Building Congress convened on Thursday and Friday, with the program on Thursday devoted to matters of specific interest to the highway construction field and on Friday to the building construction field. Space does not permit us to give any detailed discussion of the highly interesting and informative papers which were presented before the Congress on these two days. An effort will be made to publish the more important ones in subsequent issues of the *Journal*. The holding of this Congress is by all odds a highly significant and important development in the history of the construction industry. A progressive step has certainly been taken and it is hoped that nothing will be left undone to translate as soon as practicable recommendations of the Congress into definite actualities.

A comprehensive platform was approved by the Congress and is given on the following page. It deserves thoughtful and serious consideration by everyone interested directly or indirectly in the construction industry, for obviously our common interest lies in joining forces in a united effort to gain recognition for the broad, general principles on which we feel a recovery of the construction industry must depend.

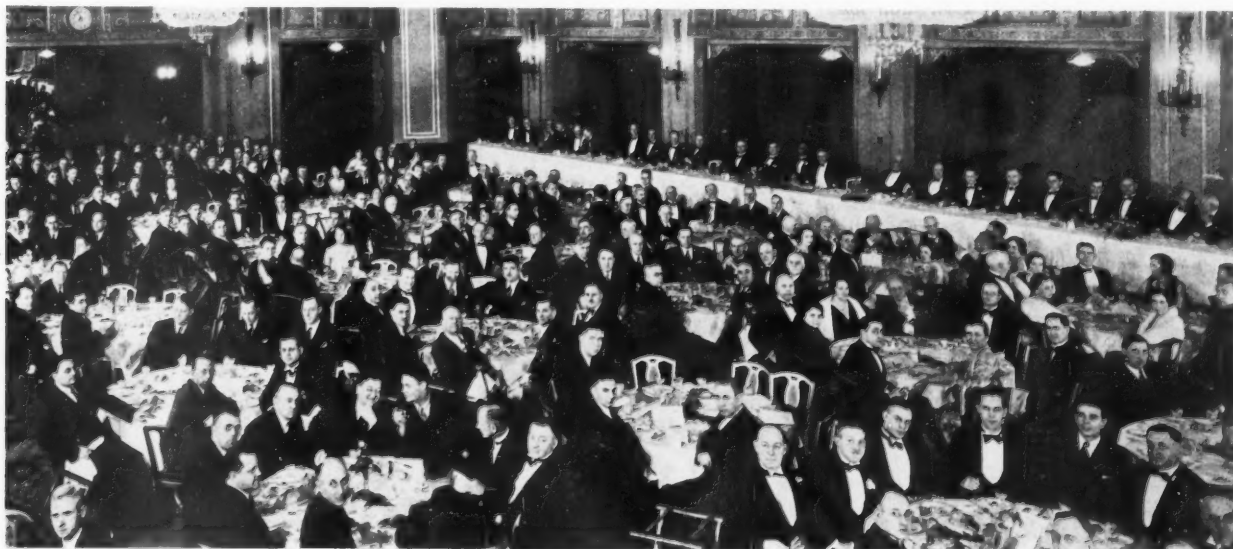
Associations participating in the Congress departed from their usual custom of holding individual banquets

♦ Leaders from all branches of construction industry participate in Detroit meeting.

and all joined in a Highway and Building Congress Banquet. This affair which was held on Thursday evening at the Masonic Temple proved a thoroughly enjoyable occasion. A matter of especial pride and gratification to the crushed stone industry should be the selection of Otho M. Graves as toastmaster for this affair. He discharged this exacting responsibility with an eloquence and graciousness of manner which contributed much to the pleasure of the occasion and crushed stone producers may well take pride in the fact that one of their own number was chosen for this signal honor.

Owing to the fact that a number of the delegates attending conventions during the early part of the week found it impossible to remain over until Friday, the attendance at the banquet was not so good as had been expected. Despite this, a very creditable assemblage was present and gave every indication of thoroughly enjoying the excellent speaking program which had been arranged.

Because of a feeling shared by many in the construction industry that the Chamber of Commerce of the United States has not always listened with sympathetic interest to the problems of the construction industry, the remarks made by Henry I. Harriman, President of



Among those present at the Highway and Building Congress Banquet, Masonic Temple, Detroit, Michigan, January 19, 1933

Resolutions Adopted by Highway and Building Congress

1. *Urge Public Improvements*—We are unalterably opposed to the dole system and strongly advocate in lieu thereof first, an immediate constructive program of sound and needed public and semi-public improvements; and second, the adoption of such measures as will hasten the resumption of private construction in industry. Among the public and semi-public projects are highways, waterways, and other forms of transportation; flood control, water works, sewage and refuse disposal, public buildings, and other similar projects.

2. *Government Economy and Public Improvements Charged to Capital Account*—We demand maximum economy in the current administrative and operating expenses of government as well as an increased program of public works financed out of capital account. To further this end we urge that wherever possible the investment of the national government, states, cities, and other governmental subdivisions in permanent improvements be charged into capital account, as is the practice of private industry, and that only the carrying charges and amortization be included in current operating budgets.

3. *Liberalize Emergency and Construction Act*—In view of the ineffectiveness of the construction loan operations that have been carried on under the Emergency and Construction Act, we advocate liberalization of self liquidating requirements and reduction of interest rates by suitable amendments of that Act.

4. *Sewage Works*—We appeal to states and municipalities to enact immediate legislation that will place upon a self-sustaining and self-liquidating basis through service charges such public services as sewage and sewage disposal.

5. *Relief Funds for Work Instead of Doles*—We urge that all public agencies engaged in distributing relief funds adopt the policy of applying those funds wherever possible through planned useful work instead of through welfare doles.

6. *Extend Date for Emergency Federal Aid*—We urge the extension of the date of completion of current emergency federal highway work from July 1 to October 1, 1933.

7. *No Curtailment of Federal Aid*—We deplore the proposal that federal aid to state highway improvement be curtailed or suspended at this time, and we urge Congress to continue the federal aid policy by appropriating during the present emergency a sum equal to that appropriated last year, and in any event not less than the revenues from federal taxes on gasoline and tires.

8. *Oppose Gas Tax Diversion*—We demand that the revenues raised from motor and vehicle fuel taxes and license fees be used exclusively for highway construction and maintenance, and we oppose the diversion of these fees and taxes to other purposes.

9. *Broaden Federal Aid for Use in Cities*—We advocate the extension of federal aid to those organizations of state and federal aid highway systems within city limits, and we recommend such allocation as will give a fair proportion of the highway funds to municipalities for streets and roads within their corporate limits.

10. *Reasonable Regulation of Highway Transportation*—We endorse the proper and reasonable regulation of highway transportation, such regulation to be premised on sound economics and not on a desire to establish parity of cost with other forms of transportation.

11. *Low Rental Housing*—We urge that all necessary measures be undertaken to promote the construction of adequate low rental housing and that the various states enact legislation to grant the power of eminent domain for this purpose.

12. *Reduction of Interest Rates*—Believing that the heavy interest charges of fixed obligations are a serious obstacle to early credit restoration, we urge as an essential of economic recovery that interest rates on such fixed obligations be reduced and adjusted to conform to the general price level.

13. *Amend Bankruptcy Laws*—We recommend that the federal government and the several states amend their bankruptcy and related statutes to simplify the process of reorganizing public and private financial structures by providing that approval of a substantial majority of bond or other certificate holders shall be sufficient to authorize such reorganization.

14. We urge that state laws and municipal charters be amended to permit deferring payment for at least two years of the initial installments of special installments without penalty and at moderate interest.

15. *Uniform Mechanics' Lien Law*—We endorse the uniform mechanics' lien account prepared by the Standard State Mechanics Lien Account Committee of the United States Department of Commerce and the National Conference of Engineers on Uniform State Laws, and urge the enactment of this legislation by state legislatures.

16. *Government in Business*—We urge that the government cease engaging in any form of business and service not clearly necessary to the administration of governmental functions.

17. *Department of Public Works*—We urge that the United States Congress establish a National Department of Public Works.

18. *Establish Congressional Committees on Construction*—In view of the vital relation of construction to public welfare, we urge that standing committees on construction be set up in both branches of the Congress of the United States similar to those of agriculture, finance, and so forth, so that Congress may be enabled to act with greater knowledge and broader judgment on construction matters.

19. *Advance Planning of Public Improvements*—Believing that public and semi-public works can be carried out efficiently and economically only under a coordinated and balanced program of national, state, and municipal works, we urge comprehensive advanced planning of public improvements, accompanied by long-term financial planning as the soundest policy of conducting public works, and we recommend that legislation to carry out such policies be enacted.

20. *General Sales Tax*—We favor the enactment of an emergency general sales tax as a means of reducing other forms of taxation and furthering the program of public and semi-public improvements that we advocate.

21. *Labor and Materials Currency*—We recommend that if further financial measures are found necessary to restore employment and value, consideration be given by Congress to the establishment of a rigidly controlled increase of circulation by issue of currency based on labor and materials actually expended in useful construction, such currency to be issued only as compensation for work completed.

22. *Rehabilitation and Repair*—To give more immediate aid to the unemployed we urge all communities to plan and put into effect an intensive campaign of rehabilitation and repair.

23. *Hand Labor*—While recognizing the urgency of reducing unemployment we demand that public work be performed by the most modern and efficient methods and we oppose the indiscriminate substitution of hand labor therefor.

the Chamber, are of especial interest and should be highly gratifying. Mr. Harriman addressed the banquet in part as follows:

The Chamber of Commerce of the United States is genuinely interested in the problems of the construction industry. It alone can not solve these problems. For that we must depend upon the leaders and the business and professional concerns engaged in construction work. But the Chamber can help. Concrete evidence of its willingness is its active participation in and underwriting of the National Conference on Construction, which was set up at the suggestion of leaders from various lines of business and of the professions concerned with the welfare of construction. While that effort no doubt was handicapped by the trying situation of the past year, its general meeting in Washington last October revealed abundant evidence of the determination of leaders in all branches of the industry to place the industry upon a more secure foundation of operating efficiency and responsibility. This Conference meeting served also as a valuable educational forum to clarify the important relationships and mutual interests of the construction industry and the business community as a whole.

Much, of course, remains to be done. Recognition of this on a scale hitherto unknown is evidenced in this great Congress now in session. Plans must be more than formulated. They must be carried into the daily operations of business to be effective. We can say without exaggeration, however, that the construction industry is putting its house in order, determined to meet and overcome hesitation and lack of confidence by providing the public with a more efficient and less costly construction service than it has at any time enjoyed.

The Chamber of Commerce of the United States has been one of the leaders in obtaining Federal cooperation in the improvement of the interstate system of roads, and has encouraged public policies designed to release state and local funds for use on secondary roads. The present emergency fiscal difficulties of the Federal as well as state and local governments, and the Chamber's necessary emphasis in the interest of all business and of every citizen, upon the restoration of budgetary equilibrium without delay, must not be confused with the Chamber's unshaken commitments in favor of a well-rounded program of highway improvement. Although seeking in every practical direction for ways to reduce Government expenditures, always a difficult and painful task, the Chamber has at no time placed itself in opposition to the principle, to which it is committed, of Federal highway appropriations.

The Federal and the state and local governments have given full recognition, and in my judgment should continue to the extent practicable, to give recognition to the employment possibilities of road building. State highway departments have responded splendidly to this problem. In practically every state they are cooperating with state and county unemployment committees. Not only is it possible to give additional men direct employment on road work through the short working week, but the highway paving dollar itself, when analyzed, is found to be distributed in very large percentage in the form of wages to labor.

The Chamber stands in four-square opposition to the diversion of gasoline taxes. It has repeatedly gone on record as opposed to such diversions. The Chamber's position is "that taxes specially levied against highway users for highway development and maintenance should be levied and collected exclusively by the state and in the present stage of highway development expended by or under the direction and supervision of the state, solely on highways of general use, whether now in state or local systems."

Of further interest in this connection is the recent report of the Chamber's Committee on Competing Forms of Transporta-

tion, which will come before the membership for action at the coming Annual Meeting this May. The Committee "recommends that gasoline taxes should not be so high as to encourage wholesale evasion, and opposes Federal invasion of this field of taxation."

Unfortunately the desperate financial situation of some cities and counties has led to emergency diversion of gasoline taxes to provide unemployment relief funds. This is evidence of how our communities are suffering from an antiquated general property tax theory inherited from Colonial days, and good enough for a horse and buggy economy. At that time the land constituted 95% of national wealth and it was therefore natural that land should pay the great bulk of the taxes. The continuance of that tax theory is working an infinite hardship upon the owners of our farms, homes and other real estate. They must be relieved from this inequitable tax burden which under present conditions in many instances is crushing. At the same time essential services, including highway maintenance and improvement, must be continued. In my judgment the solution of the problem of expenditures by our cities and towns is two-fold, to wit, a reasonable curtailment in expenditures, and some new consumption taxes. While the member organizations of the Chamber have gone on record against general sales taxes in the states, I personally believe the sales tax offers possibilities of meeting tax needs in these present times which should seriously be considered.

The Board of Directors of the Chamber last June expressed its approval of the policy of the Reconstruction Finance Corporation in lending funds to productive agencies for the purpose of increasing employment. In recommending departure from normal channels for financing construction work in order to create employment, it was the judgment of the Board that care should be exercised to avoid expenditures that would increase tax burdens through future maintenance or operating costs. In spite of many technical and legal difficulties in getting work actually started under the self-liquidating formula, I am confident that, through the aid of the Reconstruction Finance Corporation, we shall shortly have under way in various parts of the country a large volume of construction projects which are economically needed and which it is fair to expect will pay their way.

L. W. Shugg Becomes Manager of Exhibits for General Electric

To his many friends throughout the crushed stone industry it will be decidedly welcome news that L. W. Shugg, according to a recent announcement by C. H. Lang, manager of the publicity department of General Electric Co., has been made Division Manager in Charge of Conventions and Exhibits of that company. He succeeds Frank H. Gale who retired from the company on January 1, upon completion of forty-three years' service. Mr. Shugg, who through his years of experience in exhibits and convention work, is probably one of the best known men in the electric power industry, entered the employ of the General Electric Company in 1902 and since 1909 has been associated in exhibition work.

We take this opportunity of extending to Mr. Shugg our most hearty congratulations and best wishes for continuing success in his new responsibility.

Cement-Bound Macadam

By E. M. FLEMING

Manager, Highways and Municipal Bureau
Portland Cement Association, Chicago, Illinois

◆ Presented before the Sixteenth Annual Convention of the National Crushed Stone Association, Book-Cadillac Hotel, Detroit, January 16-18, 1933.

CEMENT-BOUND macadam is just what its name implies, that is ordinary macadam having a cement mortar as its binding unit rather than saturated screenings. Construction methods except for those which are affected by the mortar binder are also very similar to water-bound macadam.

Essentially this kind of construction is accomplished by placing on a prepared subgrade a layer of large sized coarse aggregate or macadam stone. This layer is compacted by a steam roller until a relatively dense and smooth surface is obtained. A thin grout is then applied to the surface until the voids in the aggregate are filled, after which a lighter roller is applied to the surface. In the meantime surface irregularities are corrected, so that when the roller has produced an even dense surface, final finishing can be done with floats and belts.

History

The first cement-bound macadam pavement on record was laid in Edinburgh, Scotland, on Gillespie Crescent in 1872. It is $1\frac{1}{4}$ miles long and is still in service. In 1920 the cost of maintenance had been \$200 during its 48 years of life. Two similar sections were laid in Edinburgh in 1873 and are still in use.

In the British Isles relatively large mileages of this type of road have been laid in Ireland and in North-western England. A sandwich type of construction is used and the slab is generally built as a resurface over old macadam or concrete bases. After experimenting with various methods of construction, the British Portland Cement Association reports that it deems this type the best.

In France dry method is preferred to either the Hassam type used in this country or the sandwich type used in England. In this method a layer of dry cement mortar is placed upon the compacted stone. The mortar is then wetted and rolled and swept into the stone. Belgium and Germany have also built considerable mileage. In Germany the preferred method seems to be the sandwich type built as a resurface over old gravel or macadam.

In Australia the Hassam type such as is used in this country is preferred, although the sandwich type and the dry grouted type have both been tried. Methods are very similar to those used here, except that an excess of grout is worked to the surface and $\frac{3}{4}$ inch chips are rolled in until all the voids are filled. The

approximate mix then is 1:2½:12 and the average compressive strength at 28 days is 3,000 pounds. A notable development in Australia, although it may not seem so to stone producers, was the successful use of river gravel as a coarse aggregate.

Advices received from Mr. R. B. Hinder, Manager of the Australian Cement Manufacturers' Association, state that this type of construction costs only 2/3 as much as standard concrete and he believes that further development will make it even cheaper. Cross-sections there are uniformly 6" thick, slabs are placed on the original subgrade and on roads which carry relatively heavy traffic.

The first cement-bound macadam pavement in the United States was built in Worcester, Massachusetts, by Captain Hassam who was then street commissioner. That was on June 14, 1905, and almost at the same time Claude Magill, Superintendent of streets for Lynn, Massachusetts, began the construction of an almost identical pavement.

About 100 miles of this type of surface was built in Connecticut, 200 miles in Massachusetts, 100 miles in New York, 150 miles in cities of New York, 44 miles in Detroit and 200 miles in Oregon and Washington. In addition sections were built in Illinois, Arkansas, Virginia, Missouri, North Dakota, New Mexico, New Jersey, Michigan and Texas.

Examples of remarkable service on the part of old cement-bound macadam pavements have been uncovered recently. A section of Methodist Street in New London, Connecticut, was built in 1906. It is still in service today after nearly 27 years. Four sections on the Boston Post Road were built in 1914 and are still carrying the enormous traffic of that main artery, between New York and New England after nearly 19 years despite their thickness of only 6 inches. The surface mortar has worn off exposing the stone in a mosaic that has great resistance to wear. There have been few corner breaks or other failures of any sort and little maintenance has been required.

There are many other old sections still in service. Examination of them convinces us that a high durable pavement can be built by this method.

The demand for more rapid increase in the mileage of surfaced highways, particularly on secondary roads is forcing the attention of engineers to a consideration

of ways and means of doing this while at the same time avoiding the pitfall inherent in the construction of a large mileage of surfaces which have a relatively short life and high maintenance charges during that life.

Recent Construction in the United States

Concrete as we ordinarily know it has proven itself to be not only a satisfactory surface to the motorist but what is more important, a highly economical one. Nothing was more natural than that engineers should seek to adapt this material to the improvement of secondary roads. During 1932 five sections of cement-bound macadam were built in the Eastern states.

Morris County, N. J., was the pioneer in the revival of this type. In July it built with its own forces a section 500 feet long on the road between Chatham and Myersville. Its success from a construction standpoint and its economy in comparison with other types that the county had been building led to the construction of another section near Chatham.

Somerset County, N. J., has just completed a section on Rock Avenue near North Plainfield. Meanwhile the Pennsylvania Highway Department built a section 5,290 feet long with its own forces on Route 182, between Bath and Moorestown. This section is 18 feet wide and has a 6 inch uniform section except for one stretch where an 8-6-8 section was used.

The New York Highway Department has just completed by contract a 6 in.-18 ft. section 5,050 feet long on the Newburgh-Vails Gate Road just south of Newburgh. It is essentially the same as the sections just described except that on the New York job the experience gained on the four previous jobs was used to advantage. Immediately after the conclusion of this paper motion pictures of the construction of this work will be shown. Mr. James H. Bixby as District Engineer of the New York Highway Department had charge of this work and he is responsible for the motion pictures also. We are fortunate in having Mr. Bixby with us today for I am sure that his discussion of this type of construction and its possibilities will be an extremely valuable addition to the information presented here.

Highlights of Construction and Design Details

The motion pictures will tell the detailed story of the construction of this pavement much better than can be done verbally. I will therefore point out only those features wherein this type differs from ordinary concrete construction.

It will be noted first of all that a 6 inch uniform and not a thickened edge section is used. It is believed that this cross section will be adequate for the

weight and volume of traffic using a secondary road. With pneumatic tires on practically all trucks and with their high speeds forcing them nearer the center of the slab, the center and not the edge is more likely to be the critical point of structural weakness.

Subgrade preparation is much similar to that in ordinary concrete pavement work, except that it need not be quite so accurately done. Whether forms are used or earth berms are thrown up as in water-bound macadam construction is optional with the engineer. Good results have been obtained either way although there are indications that wooden forms may prove more satisfactory and just as economical.

Coarse aggregate can be either crushed stone or crushed gravel. Because of the tendency to crush and abrade the aggregate during construction, the harder and tougher aggregates will give the best results. We are recommending that the aggregate when tested by A.S.T.M. methods shall have a toughness of not less than 6. When the per cent of wear is not greater than 4, the aggregate shall range between 1½ inches and 2½ inches as measured on standard sieves. When the per cent wear is greater than 4, but less than 6 the maximum allowed sizes shall range between 2½ and 3½ inches.

Coarse aggregate is spread with an allowance of about 20 per cent for compaction and loss in the subgrade to the required loose depth by dumping from trucks into spreader boxes such as those used in water-bound macadam construction.

Regardless of the size specified it is important that not more than 5% of the aggregate pass the minimum sieve. Fine material in the coarse aggregate together with that broken and abraded under rolling and traffic, collects on the subgrade and prevents penetration of grout for the full depth of the slab.

This type of construction uses more coarse aggregate per unit than standard concrete construction and approximately the same as bituminous types. A 1:2:3½ concrete will require about 1,900 tons per mile for a 6-inch thickness. The Newburgh job, 6 inches thick, with proportions approximately 1:2:8, used 2,800 tons per mile. A 6-inch mixed-in-place bituminous road will use about 2,700 or 2,800 tons.

In cement-bound macadam approximately one barrel of cement is required per cubic yard of completed surface. Standard concrete pavement requires about 1.45 barrels. Thus in advocating this type of construction we are being real philanthropists to the crushed stone industry. We are reducing the cement content by 31% and increasing the requirements for coarse aggregate by 47%.

For the fine aggregate in the grout ordinary concrete sand passing a ¼-inch sieve is satisfactory. Mortar is to be proportioned 1:2 on a dry rodded basis. The amount of mixing water will depend upon conditions,

but will generally range from 7 to 8 gallons per sack of cement including moisture in the sand.

Initial rolling should be done with a roller weighing not less than 7 tons nor more than 10 and should be only sufficient to compact and smooth the surface. Keying of the stone to the degree done in water-bound construction is not believed to be necessary or desirable.

Cement grout may be mixed at a central plant, truck mixed or mixed on the job. Where central mixing is used agitator bodies will be necessary. When grout is placed on the rolled aggregate, care must be used to prevent the stream of fast moving grout from displacing the aggregate. Immediately after grouting the surface is rolled with a tandem roller weighing not less than 5 tons nor more than 7 tons. This is to secure penetration of the grout.

Straight edging and correction of surface irregularities is done at this stage after which the final rolling is commenced with the tandem roller. Grout is added where necessary and rolling is continued until an even dense surface is obtained.

Surface smoothness is required to be within $\frac{1}{2}$ inch in 16 feet. This will result in riding qualities approximately the same as that obtained on other surfaces used on roads of this class.

Finishing is first done with hand floats, followed by a burlap belt manipulated as in standard concrete pavement construction. A final touch is given by

dragging a single strip of burlap over the surface.

Curing can be done either with 48 hours of wet burlap, if water is available, or if not, curing may be omitted and the hardening accelerated by the addition to the grout of 2 pounds of calcium chloride per sack of cement.

Pavement may be opened to traffic in five days between June first and October first. In other periods at the option of the engineer.

Cost data from jobs built to date, indicate that these surfaces can be built for about \$1.00 per square yard. With the development of better equipment and technique, costs should be still lower.

In this country there are approximately 2,700,000 miles of roads outside of state systems. Of this mileage only 500,000 miles have been surfaced in any manner. About 80% of these surfaces are not adequate for traffic and climatic conditions which they must encounter and therefore are not economical. If we are to maintain a continuing highway program, these surfaces must be replaced by those of more economical materials. Right on the main secondary roads then, we can see possibilities for about 400,000 miles of new construction. No account is taken here of the remaining 2,300,000 miles, but certainly some part of that will require surfacing.

Here then, is a tremendous market both for you and for us, and one that cement-bound macadam can well fit into.

Discussion of Mr. Fleming's Paper

By J. H. BIXBY

District Engineer, New York State Highway
Department, Poughkeepsie, N. Y.

YOU have heard the able and comprehensive paper by Mr. Fleming and you have seen the film which describes rather completely the story of recent development of cement-bound macadam construction. However, there are a number of construction details and ideas developed from our experience and observation on this contract which should be of interest to highway engineers and producers of highway material.

You will recall that the pictures showed the preparation for this pavement by steam shovel excavation. It was not found practical to scarify and reshape the old road metal to form a satisfactory subgrade for this type of construction. This, however, cannot be considered a detriment, as in most cases on roads previously improved it will be found impracticable to raise the grade by the depth of the new pavement on account of

drainage structures or local improvements, or the alignment of the old road will be so unsatisfactory that the old road metal cannot be considered for foundation purposes whether usable or not.

Coarse aggregate for this contract consisted in general of washed trap rock graded between the $2\frac{1}{4}$ " and $1\frac{1}{4}$ " circular rings. Tests on the job showed 100% passing the $2\frac{3}{4}$ ", 92% passing the $2\frac{1}{4}$ " and 4% passing the $1\frac{1}{4}$ ". With mortar penetration an essential factor in the success of this type of construction, we were not concerned with the 8% of stone slightly above the specification limit for obvious reasons, and were pleased at the low percentage of 4 passing the smaller screen, practically all of which was stone just under the specification limit.

In other words, our coarse aggregate consisted of very clean stone substantially meeting the specification sizes, entirely free from fine material, and as might be expected, penetration of the grout to the bottom of the pavement was found on a score of test holes made during the construction, and after the completion of

the pavement. With coarse aggregate of this character, we feel that complete grout penetration is sure, but it appears equally sure that if the coarse aggregate contains any substantial amount of stone dust or fines, unequal grout penetration and unsatisfactory results will follow. For this type of pavement, Rule No. 1 is recommended, as follows: Use only very clean stone from which all fines passing the $1\frac{1}{4}$ " ring are rigidly excluded.

How fast can this pavement be laid? Apparently as fast as the crushed stone can be delivered, spread and grouted. Progress was slow on this New York contract, but unusual rains, cold weather, and short daylight hours combined to hamper the contractor's plans and progress. Under satisfactory conditions a thousand, fifteen hundred or even two thousand lineal feet of stone might be placed with adequate hauling equipment, indicating the speed of grouting as the controlling feature in the progress of completed pavement.

From our observations the grout in a three-yard truck mixer can be discharged in about ten minutes, filling the voids in approximately 25 lineal feet of 18 ft. pavement. This indicates 150 lineal feet of completed grouting per hour or 1,200 feet of completed full width pavement per eight-hour day. This is equivalent to 2,400 lineal feet of single lane concrete pavement construction which is an excellent run under the best of conditions. Of course, 1,200 lineal feet of completed cement-bound macadam per day has not been demonstrated but nothing in our experience on the Newburgh contract suggests that such results may not be obtained with proper organization and adequate equipment.

The picture states that we eliminated the minor depressions discovered by the straight edge after grouting by the spreading of fine stone in the sags, which is true with substantial qualifications. In the first place, not many depressions were discovered worthy of special treatment. In the second place, the Engineer in charge did not like the appearance of the fine stone applied for leveling, as it had the appearance of a separated course which might shell off and he therefore treated additional surface waves by diagonal rolling or by raking a few stones out of the high spots and into the low spots and then re-rolling. Personally, I feel certain that the small stone rolled into the soft grout will stick but the alternate method is suggested for those engineers who may be shocked by any such procedure.

We built this road without forms but both the contractor and engineer joined in expressing preference for forms on any similar contract. The contractor stated that furnishing and handling forms would have been cheaper than the hand work on the shoulders and the hand work necessary to chip off the lip developed by the overflow of mortar onto the shoulder material.

The engineer favored forms for better control of the finished surface and avoidance of the lip previously referred to. It appears the 6" x 6" wooden forms might prove as satisfactory as steel forms and better permit the lapping of the roller over the edge of the pavement.

We poured several sections with hydrated lime admixtures. Where 20% based on the cement content was used it smoothed the grout, which penetrated the stone in the same satisfactory manner as the grout without the admixture; but with 35% of the lime admixture the penetration was a little less positive than with 20% or with no admixture at all. However, both admixture sections finished more smoothly and easily than the sections without admixture.

Two per cent calcium chloride admixture was provided for curing on the entire contract to avoid the laying of pipe lines for sprinkling. Weather conditions were not considered in providing this specification as it was assumed that construction would be completed before cold weather. However, long continued rains extended the construction into late November, when an unseasonable cold wave developed temperatures between 30° and 45° during the day and with as low as 10° during the night. Owing to the lateness of the season, pavement work continued for two or three days under these conditions and we are certain from comparison of this work with untreated concrete pavement laid during the same period, that the calcium chloride admixture substantially expedited setting of the mortar, permitting more early finishing and covering of the pavement than would otherwise have been possible.

These are about all the construction details worthy of special comment, which is astonishing as much more difficulty and trouble might reasonably be anticipated in establishing a specification and routine for a type of pavement entirely new, at least to this generation.

With no previous experience with this type of work, satisfactory results were obtained without any especial problems or difficulties except those presented by the weather and where the engineers arrange for better weather it appears that they need have no hesitation in attempting to produce a satisfactory heavy-duty road with this type of construction.

Granting the simplicity and practicability of this new pavement, there still remains the question why it should be considered in place of its near relative cement-concrete or some other type of pavement, and the answer simply is cost.

Twenty years ago there were only two principal types of pavement — broken stone macadam and block or asphalt on a concrete base. To meet the demand for a pavement more rigid and durable than macadam, and less expensive than the surfacing on concrete base, engineers simply improve the concrete base so that it

would carry traffic without a protective surfacing. This, however, was much more easily said than done and it required several years of trial and tribulation before it became recognized that the effort to produce a more economical rigid type pavement had been accomplished.

But now a new problem in economy arises—in the midst of deflation and with most of the current demand for roads on the farm-to-market routes, even the most economical of the rigid type construction appears to be too expensive for the public pocketbook on secondary routes, and a still cheaper pavement is demanded. To meet this demand the cement-bound macadam is designed.

On our New York contract you have noted the pavement cost of \$1.08 per square yard on an experimental contract less than a mile long. With an established and accepted routine and with larger units of work it seems entirely reasonable to anticipate costs of less than \$1.00 per square yard.

In 1932, with costs sharply reduced from 1931 and with the lowest prices since 1916, all the cement concrete pavement laid by the New York State Division of Highways averaged in cost approximately \$1.80 per

square yard, and it thus appears that cement-bound macadam may be built for a little more than half the cost of first class concrete. The cement-bound macadam will lack the orderly and finished appearance of the concrete road, it will not ride with the liquid smoothness of the higher type pavement, but it may properly be designed where the cost of a more expensive pavement is not justified.

In cases where the old road foundation is not usable because of excessive crown or alignment, or in case no old road foundation is available for new construction, apparently cement-bound macadam like its next of kin, concrete pavement, will furnish both foundation and road surface adequate and satisfactory for traffic of all kinds at all seasons of the year. We will not for sometime have a record of service and durability on current construction of this pavement, but Mr. Fleming has already referred to the remarkable service record of earlier examples of this type of construction, and with modern improvement in the quality of crushed stone and other highway materials, and with the experience gained in twenty years of concrete pavement construction, there appears to be every reason to expect both durability and low cost of maintenance from cement-bound macadam construction.

Discussion of Mr. Fleming's Paper

By H. A. PEARSON

Fred T. Ley and Co.,
Springfield, Mass.

GENTLEMEN, in talking about the low cost of highway construction, Mr. Fleming mentioned the sandwich type of road. The sandwich type method of laying a macadam road or a mortar-bound macadam, as we call it, has been developed in England and Germany to a far greater extent than in this country.

The Germans have developed a method of combining or coating cement with asphalt. This has been introduced in this country, or is being introduced into this country, by the T. R. C. Company, which is nothing more or less than standard Portland specification cement, coated with bituminous material, used in the construction of sandwich-type roads.

The method of laying is to first lay a course of stone. The recommendation for the time being is a four-inch road. A four-inch surface on any substantial base will serve the same as a six-inch concrete or a six or seven-inch bituminous. You first lay, to get a four-inch road, $2\frac{1}{2}$ inches of $2\frac{1}{4}$ stone. You have to be very careful in concrete engineering not to get the small stone in because, the same as with the Hassam

type method or the penetration type, you must get penetration, and the smaller stone will interfere with penetration. However, with the sandwich type, instead of getting penetration you get compression. You get your penetration through compression.

On top of the $2\frac{1}{2}$ inches of stone is laid a mixture of mortar, approximately $1\frac{1}{4}$ inches in thickness. The mortar is made of one part temperature-resisting cement, and two parts sand. The sand can have more fines in it than ordinary concrete sand, and you will find that it will work considerably easier and better.

On top of this sandwich layer is spread another $2\frac{1}{2}$ inches of stone, and the entire mass is rolled together with a 12 to 15 ton roller. It leaves the effect of water-bound macadam road with the stone showing. On top of this surface you just spread a very light broom coat of mortar with $\frac{1}{4}$ -inch stone chips thrown into it, rolled with a light tandem roller (a 6 to 8 ton roller) which leaves a finished roll. This top coat eventually wears off, starting from 14 to 21 days to throw off under traffic, and, depending on the traffic, it will entirely throw off, leaving a mosaic effect exactly similar in appearance to a macadam road, with the exception of being very nearly the color of concrete.

The addition of asphalt to the cement, or the combi-

nation of the two, slows up the set of the cement, so that the initial set does not take place until between eight and ten hours after hydration. You can actually roll the road or the mass for a period of twelve to fifteen hours without injuring the set of the cement.

Immediately after the roller has completed its work, the road can be opened for traffic. The cement does not get a 28-day set until from 100 to 128 days, and the more abuse, apparently, that you give it under traffic, the better it is. The addition of asphalt also gives the cement the property of being able to be better compacted. In fact, a cubic foot of the compacted material weighs 170 pounds as against 140 pounds in a cubic foot of concrete. It is absolutely water-tight with perfect density.

While in this country we obtained what we did not expect to get—some cracking—in Germany, with approximately two to two and one-half years of service, they have not developed any cracks whatsoever. Mr. Ashton, who was supposed to do the talking this afternoon, is working now on that and has assured us that with the slower-setting cement to start with—not the fine-ground cement which has been developed by the companies for rapid construction, but the old-fashioned, coarse-ground cement, coated with asphalt—the rigidity, as far as the early set is concerned, will be very much delayed, and we will get away from the stresses set up by the quick-setting cement and, if not entirely away from the cracks, he expects that there will be sufficient asphalt so that they will be self-healing. The cracks, however, that we do have, show absolutely no raveling whatsoever.

As in a macadam road, if you get a flat stone under the roller that rests on the stone beneath and produces what we call a rocker stone, under traffic that stone will loosen. In fourteen to twenty-one days you simply go over the road, lift out the stone, take some of the mortar and put it in place of the stone, and there is absolutely no shrinkage. There is perfect bond, and under immediate traffic it will not be thrown out.

Another advantage about the sandwich-type road, which of course rests entirely on the macadam principle, is the exposure of the stone so the stone takes the traffic, takes the load and takes the wear.

In answer to the question that was asked about the penetration road in a rain storm, we laid in Hampden, Massachusetts, about two thousand feet of experimental sandwich-type road with the T. R. C. cement. One day it rained steadily all day long from early morning until late at night. We laid and completed during the steady rain about 600 feet of this road with the sandwich-type method, and I believe if you saw it today you would say that which was laid in the rain is better than that which was laid during the clear days.

I don't want you to confuse it with the penetration

type, because it is strictly and purely and simply a macadam with a mortar binder, and the fact that the cement is so delayed in set—in both the initial set and the final set—enables you, just as in a macadam road, to key up your surface, take off the low spots and take off the high spots. You have from twelve to fifteen hours to do that on the rolling.

The cost of this road is almost exactly the same as the cost of the Hassam road. The cement is more expensive than the ordinary Portland cement, but the road in Hampden, with welfare labor, with absolutely no experienced men whatsoever, with no machinery whatsoever (all hand labor), cost \$1.11 a square yard. Of that \$1.11 a square yard, there was about 11 cents a square yard which we had spent taking care of the base which was supposed to have been delivered to us in proper shape to take the surface. Thank you.

Presidential Address

(Continued from page 14)

and I urge you to take advantage of this unusual opportunity to hear about and see the latest developments in quarrying methods and equipment.

I want to impress upon you the magnitude and importance of this immense gathering of the construction industry here in Detroit. Our Association is one of thirty participating organizations. Never before in the history of the construction industry has anything so stupendous been undertaken. We expect this Highway and Building Congress to focus the eyes of the entire country upon the construction industry and we hope to convince the people of the United States that one of the quickest and most effective aids in solving the present economic depression is by means of a properly executed plan of increased public works construction.

In concluding this address I wish to express my appreciation for the earnest cooperation I have received from the Director of the Bureau of Engineering, Mr. Goldbeck, the Secretary, Mr. Boyd, and the entire Washington staff. I wish also to express my gratitude to the members of the Board of Directors and the Executive Committee for their helpful assistance throughout the year and their faithful attendance at meetings.

"Your teeth are in bad shape," said the dentist to a patient. "You should have a bridge put in at once."

"How much will a bridge cost?"

"About seventy-five dollars."

"Say, doc, can't I get along with a small culvert?"

—The Highway Magazine

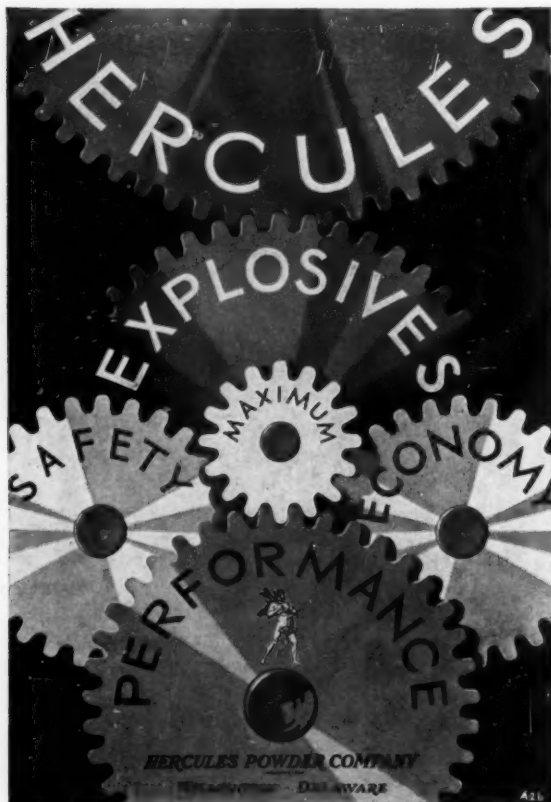
Robins Issues New Bulletin on Belt Conveyors

The Robins Conveying Belt Co. has just issued a new publication known as their Bulletin No. 82, "Robins Belt Conveyors" which contains tables and charts for determining the capacity, speed, width, power and belt-ply of any belt conveyor. The statistical information given in the bulletin is in convenient form and illustrations have been generously used showing the application of belt conveyors to a variety of industries.

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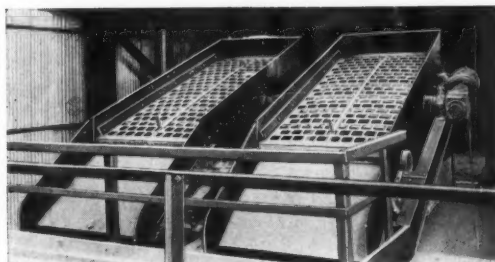
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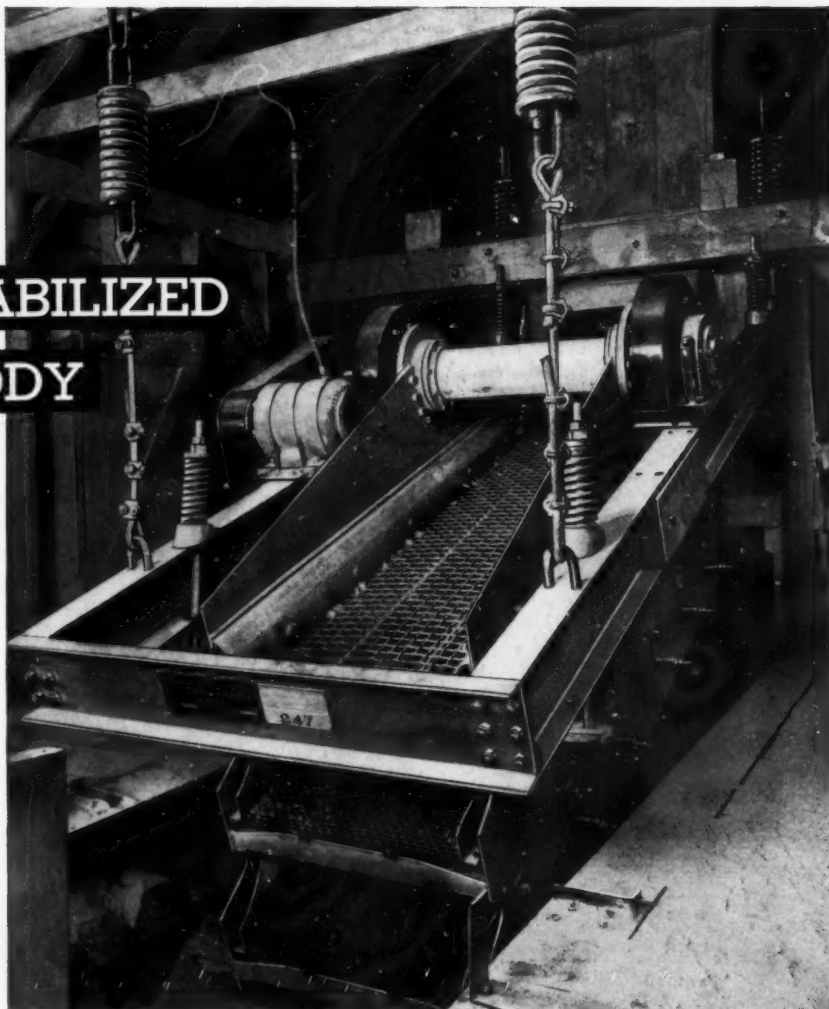
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